

CLAIMS

C.5 Accommodation of door handle-operated levers inside the latch housing, by providing a common axis of rotation for pawl, locking member and handle lever

1. A latch assembly for an automobile door or other closure, for releasably
5 detaining a striker, comprising: a housing; a pivotally-mounted latch bolt, within
the housing, shaped to retain the striker at a latching rotary position and to release
the striker at an unlatching rotary position of the latch bolt; a pawl pivotally mounted
within the housing for movement between a locking position, at which it retains the
latch bolt at its latching rotary position, and an unlocking position, at which it allows
10 the latch bolt to move to its unlatching rotary position; and a pawl release lever
connectable drivingly to an external control such as a door handle and selectively
coupled to the pawl for unlocking the pawl; wherein the pawl release lever is
mounted co-pivotally with the pawl within the housing.
2. A latch assembly according to Claim 1, comprising a rotary coupling member
15 selectively moveable between a coupling position, at which it couples rotary drive
from the pawl release lever to the pawl, and a neutral position at which it does not.
3. A latch assembly according to Claim 2, in which the rotary coupling member
is mounted for rotational and sliding movement about and over the axis of pivotal
motion of the pawl.
- 20 4. A latch assembly according to any preceding claim, comprising two such
pawl release levers, each mounted on the common pivot axis within the housing, for
operation by separate external controls such as interior and exterior door handles.
5. A latch assembly according to Claim 4, in which each pawl release lever has
a respective rotary coupling member mounted for rotational and sliding movement
25 about and over the common axis of pivotal motion of the pawl.

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6. A latch assembly according to any preceding claim, comprising at least one further lever mounted on a separate pivot axis within the housing and connectable to an exterior control such as an interior door knob, and coupled drivingly to a respective one of the rotary coupling members.

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C.6 Disassemblable latch housing, closed by a locking plate, and associated assembly process

1. 7 A latch assembly for an automobile door or other closure for releasably detaining a striker, comprising: a housing; a pivotally-mounted latch bolt, within
5 the housing, shaped to retain the striker at a latching rotary position and to release the striker at an unlatching rotary position of the latch bolt and a locking member; the housing comprising two parallel-opposed end plates joined by a side wall, the ends of the pivot for the latch bolt being anchored in the respective end plates with the pivot extending normal to the plates, and means for retaining the plates
10 releasably for non-destructive disassembly.
2. 8 .A latch assembly according to Claim 1, in which the locking member is a pawl pivotally-mounted within the housing for movement between a locking position, at which it retains the latch bolt at its latching rotary position, and an
15 unlocking position at which it allows the latch bolt to move to its unlatching rotary position, and the ends of the pawl pivot are anchored in the respective end plates with the pawl pivot extending normally to the plates.
3. 9 A latch assembly according to Claim 1 or 2, in which the retaining means comprises at least one closure plate slideable over a respective end plate or end
20 plates, the pivot or pivots extending through apertures in the said one end plate and the closure plate, and the closure plate being slideable between an unlocked position at which it is removable from the pivots and the housing is disassemblable, and a locked position at which it is held against the one end plate by an enlargement at the end of the pivot or pivots.
4. 10 A latch assembly according to Claim 3, in which the closure plate is detained
25 releasably at its locked position by a closure pushed into two overlying apertures in

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C.7 Mechanical continuation of locking/unlocking actuation

1.13 A latch arrangement for releasably retaining a striker, comprising: a latch bolt shaped to retain the striker at a latching position and to release the striker at an unlatching position of the latch bolt; a locking mechanism moveable between a locking position at which it retains the latch bolt at its latching position, and an unlatching position, at which it allows the latch bolt to move to its unlatching position; means for linking the locking mechanism to a latch-opening external manual control such as a door handle; and drive means coupled to the linking means for powered actuation to latch or unlatch the locking mechanism; wherein the linking means comprises a pivoted release lever driven by the manual control and selectively coupled by a rotary coupling member to the locking mechanism, the release lever being rotatable from a first position to a second position thereby to drive the rotary coupling member and the locking member; the rotary coupling member being moveable by the drive means between a coupling position, at which it couples rotary drive from the release lever to the locking mechanism, and a neutral position at which it does not; and the release lever being such as to prevent the movement of the rotary coupling member fully to its coupling position when the release lever is at its second position; the rotary coupling member being controlled such as to continue any motion towards its coupling position fully to completion, initiated whilst it is blocked temporarily by the release lever being in its second position.

2.14 A latch assembly according to Claim 1, in which the release lever is controlled by an electric locking mechanism which drives the rotary coupling member to its coupling position after the release lever has resumed its first position.

3.15 A latch assembly according to Claim 1, in which the rotary coupling member is mounted to a fixed frame by means of an overcentre spring which regulates its motion between its coupling and its neutral positions such that the rotary coupling

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4. ~~16~~ A latch assembly for an automobile door or other closure member,

5. A latch arrangement according to any preceding claim, for completing an
15 unlocking actuation when a handle is being actuated.

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~~7.24~~ A latch arrangement according to any preceding claim, in which the driving and indexing member is resiliently biased towards neutral stable rotary positions thereof, those stable rotary positions being between two or more actuation members, so that it is driven preferentially to such positions from intermediate, 5 unstable positions.

~~8.25~~ A latch arrangement according to Claim 7, comprising a spring-biasing arrangement acting on a rotary cam surface of the driving and indexing member, to provide the said resilient bias as a function of rotary position.

~~9.26~~ A latch arrangement according to Claim 7, in which the driving and indexing 10 member carries a spring arrangement which bears against a fixed cam surface to provide the resilient bias as a function of its rotary position.

~~10.27~~ A rotary indexing mechanism for driving actuators in a latch arrangement according to any preceding claim.

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1.28 A latch arrangement for an automotive door or other closure for releasably
5 detaining a striker, comprising: a latch bolt shaped to retain the striker at a
latching rotary position and to release the striker at an unlatching rotary position of
the latch bolt; a locking member for movement between a locking position, at which
it retains the latch bolt at its latching rotary position, and an unlocking position at
which it allows the latch bolt to move to its unlatching rotary position; at least two
10 locking member release levers connectable drivingly to respective external controls
such as interior and exterior door handles and coupled to the locking member for
unlocking it; and at least two respective coupling members, each selectively
moveable between a coupling position at which it couples drive from the respective
locking member release lever to the locking member, and a neutral position at
15 which it does not; and an electric motor drivingly coupled to each coupling member
for selective actuation thereof either separately or together, whereby controlled
movement of the motor controls the selective coupling or decoupling of each
external control.

1.29 A latch arrangement according to Claim 1, comprising an electronic central
20 locking arrangement for locking and unlocking the locking member and also for
controlling the said electric motor for the selective coupling of the external controls.

1.30 A latch arrangement according to Claim 2, comprising electric position
sensors for at least one of the components of the arrangement, to provide signals to
control the electronic central locking arrangement and/or the electric motor.

1.31 A latch arrangement according to Claim 2 or 3, in which the or each
25 electrical control is capable of being overridden by an appropriate respective
externally-accessible mechanical control.

6. ~~32~~ A latch arrangement for an automotive door or other closure, having two external controls for unlatching the latch assembly, and an electric motor for locking and unlocking the latch, and a selective coupling mechanism controlled by the said motor such that either or both external controls are selectively coupled to the latch assembly to enable them to unlatch it.

7. ~~33~~ A latch arrangement according to any preceding claim, in which the same electric motor is drivingly coupled also to the locking member for selectively unlocking it and thereby allowing the closure to open.

8. ~~34~~ A selective central locking latch using only one motor, comprising a latch arrangement according to any preceding claim.

9. ~~35~~ A combined selective central locking and electrically-powered door opening latch using only one motor, according to Claim 6.

- 1.36 A latch arrangement for an automotive door or other closure for releasably
detaining a striker, comprising: a latch bolt shaped to retain the striker at a
latching rotary position and to release the striker at an unlatching rotary position of
the latch bolt; a locking member for movement between a locking position, at which
it retains the latch bolt at its latching rotary position, and an unlocking position at
which it allows the latch bolt to move to its unlatching rotary position; at least two
locking member release levers connectable drivingly to respective external controls
such as interior and exterior door handles and coupled to the locking member for
unlocking it; and at least two respective rotary coupling members, each selectively
moveable between a coupling position at which it couples rotary drive from the
respective locking member release lever to the locking member, and a neutral
position at which it does not; wherein a first of the rotary coupling members is
formed to co-operate with the locking member release lever associated with a
second of the rotary coupling members, such that the operation of the said locking
member release lever, when the first rotary coupling member is in its neutral
position, moves the first rotary coupling member to its coupling position to enable
the other pawl release lever thereafter to release the pawl.
- 2.37 A latch arrangement according to Claim 1, suitable for use in a rear door of
an automobile, combining a child-safety lock control mechanism for selectively
moving the second rotary control member to its neutral position, in which the
neutralising action of the child-safety lock control mechanism is reversed by the
operation of the said locking member release lever.
- 2.38 A latch arrangement according to Claim 2, in which the child-safety lock
control mechanism is driven by an electric motor between positions at which it
respectively neutralises and couples the second rotary coupling member, to provide

electrical child-safety locking capable of being overridden by the operation of the said release lever, for example upon operation of an exterior rear door handle.

1.39 A latch arrangement according to Claim 2, in which the child-safety lock control mechanism is controlled by a mechanical control adapted for positioning adjacent the latch arrangement or within the latch arrangement.

5.40 A latch arrangement according to Claim 1, comprising an interior door knob for locking the door, drivingly coupled to the first rotary coupling member such that the operation of the said locking member release lever raises the door knob and unlatches the locking member, providing a panic override of the lock in the case that an interior door handle operates the release lever, ensuring unlocking and thereby enabling re-entry by operation of the exterior door handle.

6.41 A latch arrangement according to any preceding claim, in which the locking member is a pawl.

7.42 A panic door opening arrangement for use with a motor vehicle door latch, according to any preceding claim.

C.12 Central locking combined with electrical door latch release using a common motor

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~~1.44~~ A latch arrangement for an automobile door or other closure, for releasably
5 detaining a striker, comprising: a latch bolt shaped to retain the striker at a
latching position and to release the striker at an unlatching position of the latch bolt;
a locking member mounted for movement between a locking position, at which it
retains the latch bolt at its latching position, and an unlocking position, at which it
allows the latch bolt to move to its unlatching position; and means for locking the
10 locking member; and an electric motor with a driving and indexing output drive
coupled for selectively and independently driving the locking member, for electric
door opening, and also the locking means, for electric locking and unlocking.
- 2.44 A latch arrangement according to Claim 1, comprising an electronic central
locking arrangement for controlling the said electric motor to selectively lock and
15 unlock the latch.
- 3.45 A latch arrangement according to Claim 1 or 2, comprising at least one
locking member release lever connectable drivingly to an external control such as a
door handle and coupled to the locking member for releasing it to allow door
opening.
- 20 4.46 A latch arrangement according to any preceding claim, comprising a key
mechanism drivingly coupled to the locking means for locking and unlocking it
manually.
- 5.47 A latch arrangement according to any preceding claim, in which the locking
member is a pawl.

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C.13 Central locking combined with electrical door latch release and powered door closing, using a common motor

1.40 A latch arrangement for an automobile door or other closure, for releasably
5 detaining a striker, comprising: a latch bolt shaped to retain the striker at a
latching position and to release the striker at an unlatching position of the latch bolt;
a locking member mounted for movement between a locking position, at which it
retains the latch bolt at its latching position, and an unlocking position, at which it
allows the latch bolt to move to its unlatching position; and an electrically-driven
10 locking means for selectively locking and unlocking the locking member, in which
the electric locking means is driven by an electric motor, and the same electric
motor is arranged to drive the latch bolt, directly or indirectly, in order to complete
the closure of the door or other closure.

2.49 A latch arrangement according to Claim 1, in which the electric motor has an
15 output which drives a rotary driving and indexing member, and, over different
phases of its rotary movement, the driving and indexing member selectively drives
the locking and unlocking means and the latch bolt.

3.50 A latch arrangement according to any preceding claim, in which the same
electric motor is arranged selectively to release the locking member to allow the
20 door to open.

4.51 A latch arrangement according to any preceding claim, in which the locking
member is a pawl.

C.14 Central locking combined with electrical door latch release and powered door closing together with selective electrical control of interior or exterior door handle to door opening

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6.52 A latch arrangement according to any preceding claim, comprising at least two locking member release levers connectable drivingly to respective external controls such as interior and exterior door handles and coupled to the locking member for unlocking it; and two corresponding rotary coupling members each selectively moveable between a coupling position, at which it couples rotary drive from the locking member release lever to the locking member, and a neutral position at which it does not; and in which the same electric motor provides selective electrical control of the positions of the rotary coupling members in order to selectively couple one or both of the exterior controls for the opening of the door or other closure.

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6.53 A combined selective central locking and power-assisted door closing latch using only one motor, according to Claim 5 as dependent on Claim 1 or 2.

7.54 A combined selective central locking and power-assisted door opening and closing latch using only one motor, according to Claim 5 as dependent on Claim 3.

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C.16 Electrical door latch release and manual door opening, using a linear actuator acting directly on the latch pawl

- 5 ~~1.56~~ A latch arrangement for releasably retaining a striker, comprising a latch bolt shaped to retain the striker at a latching position, and to release the striker at an unlatching position of the latch bolt; a pawl moveable between a locking position, at which it retains the latch bolt at its latching position, and an unlocking position, at which it allows the latch bolt to move to its unlatching position; means for linking the
- 10 pawl to a latch-opening external manual control such as a door handle; drive means coupled to the pawl for powered actuation thereof to latch or unlatch it thereby to control door opening, wherein the drive means comprises an electrical drive motor with a reversible rotary output drive, a gearing which converts the rotary output drive to a reversible linear drive along a predetermined path, and a pawl drive member
- 15 driven along the predetermined path by the gearing and arranged to abut and rotate the pawl to move it to its unlatching position, and to return to a position at which the pawl is free to return to its latching position.
- ~~1.57~~ A latch arrangement according to Claim 1, in which the rotary output drive comprises a gear fixed to a co-axial lead screw, and the pawl drive member
- 20 comprises an internally-threaded portion in threaded engagement with the lead screw.
- ~~1.58~~ A latch arrangement according to Claim 1, in which the gearing comprises a rack and pinion arrangement, the rack being integral with, or fixed to, the pawl drive member.
- 25 ~~A.59~~ A latch arrangement according to Claim 3, in which the pawl drive member has a projection which is arranged to drive the latch bolt to effect the completion of door closure.

~~5. 60.~~ A latch arrangement according to Claim 4, in which linear motion of the pawl drive member in one direction releases the pawl to allow the door to open, and linear motion in the opposite direction drives the latch bolt closed.

~~6. 61.~~ A latch arrangement according to any preceding claim, comprising a return spring acting on the gearing to return it to the position at which the pawl is free to return to its latching position.

~~7. 62.~~ An electrically powered door opening latch arrangement using a rack actuator, according to Claim 3.

~~8. 63.~~ An electrically powered door opening latch arrangement using a leadscrew actuator, according to Claim 2.

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C.17 Electrical door latch release and manual door opening, using a rotary actuator directly on the latch pawl

- 5 ~~1.64~~ A latch arrangement for releasably retaining a striker, comprising a latch bolt shaped to retain the striker at a latching position, and to release the striker at an unlatching position of the latch bolt; a pawl moveable between a locking position, at which it retains the latch bolt at its latching position, and an unlocking position, at which it allows the latch bolt to move to its unlatching position; means for linking the
- 10 pawl to a latch-opening external manual control such as a door handle; drive means coupled to the pawl for powered actuation thereof to latch or unlatch it thereby to control door opening, wherein the electric drive means comprises a rotary output drive, and an eccentric formation on the rotary output drive which is caused to rotate uni-directionally in a circular drive path intersecting with the pawl, whereby to
- 15 drive the pawl to its unlatching position and then to release it to allow it to return to its latching position, with each rotation of the rotary output drive.
- ~~1.65~~ A latching arrangement according to Claim 1, in which the pivot axes of the pawl and the rotary output drive are parallel.
- ~~1.66~~ A latch arrangement according to Claim 1 or 2, in which the eccentric
- 20 formation is a pin or knob which is arranged to engage an edge of a release lever integral with the pawl.
- ~~1.67~~ An electrically powered door opening latch arrangement using a rotary actuator, according to any preceding claim.

C.18 Powered door closing using a rotary actuator acting on the latch bolt, with optional door opening

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1.68 A latch arrangement for an automobile door or other closure, for releasably retaining a striker, comprising: a latch bolt shaped to retain the striker at a latching position and to release the striker at an unlatching position of the latch bolt; a locking member moveable between a locking position, at which it retains the latch bolt at its latching position, and an unlocking position, at which it allows the latch bolt to move to its unlocking position; an electric motor having a rotary output drive, and an eccentric formation on the rotary output drive which is caused to rotate in a circular path, the eccentric formation being arranged to drive the latch bolt, either by direct abutment or through a mechanical drive coupling, to effect completion of the closure of the latch bolt.

2.69 A latch arrangement according to Claim 1, in which the eccentric formation is also arranged to drive the locking member either by direct abutment or through a mechanical drive coupling, the drive of the latch bolt and the locking member being effective over different phases of rotation of the rotary output drive, whereby driving the latch bolt effects completion of the closure of the latch bolt and door and/or effects powered opening of the latch bolt and door.

3.70 An electrically-powered door closing latch arrangement using a rotary actuator, according to any preceding claim.

4.71 An electrically-powered door opening and closing latch arrangement using a rotary actuator, according to any preceding claim.

C.19 Powered door closing, using a linear actuator acting on directly on the latch bolt, with optional door opening

- 1.72 A latch arrangement for an automobile door or other closure, for releasably retaining a striker, comprising: a latch bolt shaped to retain the striker at a latching position and to release the striker at an unlatching position of the latch bolt; a locking member moveable between a locking position, at which it retains the latch bolt at its latching position, and an unlocking position, at which it allows the latch bolt to move to its unlocking position; an electric motor having a rotary output drive, and gearing converting the rotary output drive to a generally linear drive of a shuttle member, a shuttle member being coupled drivingly to the latch bolt to effect completion of the closure of the latch bolt when the shuttle member moves in one direction along its generally linear path.
- 1.73 A latch arrangement according to Claim 1, in which the shuttle member is also arranged to drive the locking member, directly or indirectly, for moving the locking member to its unlocking position to allow the door or closure to open.
- 1.74 A latch arrangement according to Claim 2, comprising a return spring acting on the shuttle member to return it to a position at which it allows the locking member to return to its locking position.
- 1.75 A latch arrangement according to Claim 1, 2 or 3, in which the gearing comprises an eccentric formation on the rotary output drive and a co-operating formation on the shuttle member which engage for a phase of the rotation of the rotary output drive to displace the shuttle member from a neutral position to an extreme position.
- 1.76 A latch arrangement according to Claim 1, 2 or 3, in which the gearing comprises a rack and pinion arrangement, the rack being integral with or fixed to the shuttle member.

~~8.77~~ A latch arrangement according to Claim 1, 2 or 3, in which the gearing comprises a bolt and leadscrew arrangement coupled respectively to the rotary output drive and the shuttle member or vice versa.

~~7.78~~ A latch arrangement according to any preceding claim, in which the shuttle member is coupled drivingly to abut the latch bolt to drive it closed, thereby selectively to complete the closure of the door or other closure.

~~8.79~~ An electrically-powered door closing latch arrangement using a leadscrew actuator, according to Claim 6.

~~8.80~~ An electrically-powered door closing latch arrangement using a rack actuator, according to Claim 5.

~~10.81~~ An electrically-powered door opening and closing latch arrangement using a rack actuator, according to Claim 5 as appendant to Claim 2.

~~11.82~~ An electrically-powered door opening and closing latch arrangement using a leadscrew actuator, according to Claim 6 as appendant to Claim 2.

C.20

Anti-slam lock, preventing inadvertent locking when a door is slammed:
arranging the orientation of the lock such that the impact direction
corresponds to the open position of the actuator

- 5 ~~1.83~~ An anti-slam latching arrangement for releasably retaining a striker, comprising: a latch bolt shaped to retain the striker at a latching position, and to release the striker at an unlatching position of the latch bolt; a locking mechanism moveable between a locking position, at which it retains the latch bolt at its latching position, and an unlocking position, at which it allows the latch bolt to move to its
- 10 unlatching position; a release mechanism arranged to be coupled drivingly to an external control, such as a door handle, for releasing the locking mechanism; an electrically-driven coupling member arranged for reciprocating sliding movement between a locking position at which it isolates the release mechanism from the locking mechanism, and an unlocking position at which it couples the release
- 15 mechanism to the locking mechanism; the orientation of the latch bolt relative to the path of the coupling member being such that, in use, the locking position is substantially further than the unlocking position of the coupling member from the striker, such that, in use, when the closure of the door causes any moveable components of the latching arrangement to continue their motion relative to the
- 20 remainder of the latching arrangement in the direction of closure towards the striker, the coupling member, if in its unlocking position before impact, will not be free to move so will remain there after impact; thereby preventing inadvertent locking upon door slamming.

- 25 ~~1.84~~ An anti-slam latching arrangement according to Claim 1, comprising an electronic central locking control mechanism connected to control the coupling member.

- ~~1.85~~ An anti-slam latching arrangement according to Claim 1 or 2, comprising at least one further release mechanism arranged to be coupled drivingly to a different

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external control for releasing the locking mechanism, and a respective electrically-driven coupling member arranged for reciprocating sliding movement between a locking position and an unlocking position.

A.06 An anti-slam locking arrangement for use with a motor vehicle door latch, as

5 defined in Claim 1, 2 or 3.

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C.21 Anti-slam lock, preventing inadvertent locking when a door is slammed; actuator is retained by a projection abutting part of the latch housing.

1.87 An anti-slam latching arrangement for releasably retaining a striker,
5 comprising: a latch bolt shaped to retain the striker at a latching position, and to
release the striker at an unlatching position of the latch bolt; a locking mechanism
moveable between a locking position, at which it retains the latch bolt at its latching
position, and an unlocking position, at which it allows the latch bolt to move to its
10 unlatching position; a release mechanism arranged to be coupled drivingly to an
external control, such as a door handle, for releasing the locking mechanism; and
an electrically-driven coupling member arranged for movement between a locking
position at which it isolates the release mechanism from the locking mechanism,
and an unlocking position at which it couples the release mechanism to the locking
15 mechanism; the coupling member being moveable between a locking configuration
at which it isolates the release mechanism from the locking mechanism, and an
unlocking configuration at which it couples the release mechanism to the locking
mechanism; wherein the latching arrangement has a fixed formation which co-
operates with the coupling member only at its unlocking configuration, to prevent
20 movement of the coupling member to its locking configuration until the door has
closed and the locking mechanism has closed, whereby slamming the door, causing
impulsive forces on the latch arrangement, fails to inadvertently lock the latch.

1.88 A latch arrangement according to Claim 1, in which the fixed formation is an
elongate projection which allows rotation of the coupling member but prevents
translational movement thereof when the coupling member is at its unlocking
25 configuration.

1.89 An anti-slam locking arrangement for use with a motor vehicle door latch, as
defined in Claim 1 or 2.

C.23

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1.90 A control system for a door or other closure mounted on a frame, the door being latchable to the frame by a latch engaging a striker, the latch being moveable
5 between latching and unlatching positions such that movement from its latching to its unlatching position causes a reaction force from the striker onto the latch tending to open the door, comprising a motor coupled selectively to drive the latch from its latching to its unlatching position and thereby to unlatch and at least partially to open the door.

10 1.91. A control system for a door or other closure mounted on a frame, the door being latchable to the frame by a latch engaging a striker, the latch being moveable between latching and unlatching positions, comprising a motor coupled selectively (a) to drive the latch from its latching to its unlatching position and (b) vice versa whereby respectively (a) to unlatch and at least partially open the door and (b) to
15 complete closure of the door and to latch it.

1.92 A control system according to Claim 1, in which the door is a vehicle door, and in which the vehicle has a central locking system for the vehicle doors, in which the central locking system comprises control means for selectively opening the door or doors.

20 1.93 A control system according to Claim 2, in which the door is a vehicle door, and comprising a vehicle central locking system comprising control means for selectively energising the motor to open or to close the door or doors.

1.94 A control system according to any preceding claim, comprising a portable remote control electronic unit capable of communicating with a motor control means
25 for selectively opening the door.

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- ~~8.95~~ A control system according to any preceding claim, comprising means for locking the latch at its latching position, and comprising a mechanical actuator coupled to the locking means for disengaging the locking means from the latch.
- 5 ~~7.96~~ A control system according to Claim 6, comprising a linking means for coupling the motor to the locking means, the arrangement being such that, with the door closed and the latch at its latching position, initial movement of the motor causes the locking means to move from its locking position to its unlocking position to free the latch, and further movement of the motor then causes movement of the latch from its latching position towards its unlatching position.
- 10 ~~8.97~~ A control system according to Claim 6 or 7, in which the latch comprises a pivotally-mounted latch bolt rotatable between its latching and unlatching positions, and in which the locking means is a pawl arranged to lock the latch bolt, the mechanical actuator being coupled to the pawl for releasing the pawl and thereby unlocking the latch bolt.
- 15 ~~9.98~~ A control system according to Claim 9, comprising a motor control circuit for supplying power to the motor, and a pair of microswitches arranged in the motor control circuit such that closure of one microswitch causes motor drive in a direction such as to drive the latch to open the door, and closure of the other microswitch causes motor drive in a direction such as to drive the latch to close the door.
- 20 ~~10.99~~ A control system according to Claim 9, comprising a camming member moveable with the latch and arranged to cam the switch actuators of the pair of microswitches so as to sequence the switching of the motor in its alternating polarities for opening and closing the door.
- 25 ~~11.100~~ A control system according to Claim 10, in which the camming member comprises a cam track for each microswitch actuator, the cam tracks being generally rectangular and mutually parallel, and further comprising means for

causing the microswitch actuators to follow their respective tracks in only one direction of motion.

12.101 A control system according to Claim 11, in which the means for causing the microswitch actuators to follow their respective tracks comprises a spring biasing the camming member, relative to the pair of microswitches, in a direction in the plane of the tracks, and in which the camming member comprises a cam surface across one of the tracks which converts relative motion of the camming member and the pair of microswitches, corresponding to the opening or closing of the door, into a transverse relative motion so as to guide both microswitch actuators, as cam followers, to the next section of track in the said one direction of motion.

13.102 A control system according to any of Claims 9 to 12, comprising a third microswitch arranged adjacent the pair of microswitches, and connected electrically to a hazard light circuit, the third microswitch actuator acting as a cam follower in a third cam track in the camming member, so as to switch the hazard light on and off when the door is respectively open and closed.

14.103 A control system according to any preceding claim, comprising a relay switch for electronically switching on a motor, when the door is closed, to unlatch and partially open the door.

15.104 A control system according to Claim 9, in which the microswitch for opening the door is positioned such that it is actuated once the door has been partially opened; and a relay switch for electronically switching on the motor, when the door is closed, to unlatch and partially open the door, the relay switch being capable of being closed for a sufficient period to cause the motor to move the door to the point at which the door opening microswitch is actuated.

16.105 A control system according to any preceding claim, comprising stall current sensor circuitry associated with the supply of current to the motor, for temporarily

disconnecting the power supply to the motor in the event that a stall current is detected.

~~17.106.~~ An electrically-controlled door opening system for motor vehicles, substantially as described herein with reference to the accompanying drawings.

5 ~~18.107.~~ A central locking system for a vehicle, comprising for each of at least two doors, a control system according to any preceding claim, controlled by a central control circuit.

10 ~~19.108.~~ A motor control system comprising a motor coupled to drive a body in either of two opposite directions, between extreme positions of the body, dependent on the polarity of electric power supplied by a power supply circuit to the motor, and a pair of microswitches arranged in the power supply circuit such that closure of one of the microswitches supplies the electric power at one polarity and closure of the other microswitch supplies the electric power at the opposite polarity to the motor, the microswitches being responsive mechanically to the position and to the direction
15 of movement of the body between its extreme positions.

~~20.109.~~ A motor control system according to Claim 19, comprising a camming member moveable with the body and arranged to cam the switch actuators of the pair of microswitches so as to sequence the switching of the motor in its alternating polarities.

20 ~~21.110.~~ A motor control system according to Claim 20, in which the camming member comprises a cam track for each microswitch actuator, the cam tracks being generally rectangular and mutually parallel, and further comprising means for causing the microswitch actuators to follow their respective tracks in only one direction of motion.

25 ~~22.111.~~ A motor control system according to Claim 21, in which the means for causing the microswitch actuators to follow their respective tracks comprises a

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spring biasing the camming member relative to the pair of microswitches, in a direction in the plane of the tracks, and in which the camming member comprises a cam surface across one of the tracks which converts relative motion of the camming member and the pair of microswitches, into a transverse relative motion so as to
5 guide both microswitch actuators, as cam followers, to the next section of track in the said one direction of motion.

~~23.112~~ A motor control system substantially as described herein with reference to Figures 4 and 5 of the accompanying drawings.

~~24.113~~ A microswitch cam control system for motor drive and motor vehicle door
10 hazard light, comprising a motor control system according to Claim 20, 21 or 22, the microswitches being arranged also to operate the hazard light dependent on the vehicle door position.

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C.24 Biasing a rotary actuator to a predetermined position

~~1.114~~ A rotary actuator adapted to be driven rotationally, and suitable for indexing and driving at least one latch actuator in a motor vehicle door latch, such driving occurring as the rotary actuator is driven over a respective predetermined limited angular range for the or each latch actuator, and resilient means co-operating with the rotary actuator and, in use, with a fixed frame, to bias the rotary actuator rotationally towards a predetermined stable position outside the said limited angular range.

~~2.115~~ An actuator according to Claim 1, in which the resilient means biases the actuator, in use, to one of a plurality of predetermined stable positions outside the or each limited angular range, to provide a neutral position or positions at which the latch actuators are not driven.

~~3.116~~ An actuator according to Claim 1 or 2, in which the resilient means comprises a radial spring carried by the rotary actuator.

~~4.117~~ An actuator according to Claim 1 or 2, in which the resilient means comprises a peripheral spring arrangement around the rotary actuator, co-operating with a cam on the actuator.